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U.S. Department of the Interior • U.S. Geological Survey

# MINERAL INDUSTRY SURVEYS

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Gordon P. Eaton, Director

Reston, VA 20192

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For information, contact:

William S. Kirk, Commodity Specialist

Telephone: (703) 648-4962, Fax: (703) 648-7757

E-mail: [wkirk@usgs.gov](mailto:wkirk@usgs.gov)

David Mann (Data), (703) 648-7978

MINES-DATA: (703) 648-7799

MINES FaxBack: (703) 648-4999

Internet: <http://minerals.er.usgs.gov/minerals>

## IRON ORE IN OCTOBER 1996

U.S. mine production of iron ore in October was 4.3% lower than that of September, according to the U.S. Geological Survey. Shipments decreased by 1.8% and mine stocks increased by 13.5%. Consumption and trade data for October will be included in a subsequent report.

### New Direct Reduction Process Developed

Midrex Direct Reduction Corp. and its parent company, Kobe Steel Ltd., have developed a new direct reduction process known as the Spirex (Spouted Iron Reduction) process. The new process uses iron ore fines as feed and natural gas as the reductant to produce direct reduced iron (DRI) fines, which can be hot-briquetted. The companies plan to build a demonstration-scale plant for the process near Opco, Kobe Steel's subsidiary that produces hot-briquetted iron (HBI). Opco, located in Puerto Ordaz in the eastern Venezuelan State of Guayana, has available land and access to natural gas and iron ore fines. The plant is expected to begin operations in the second quarter of 1998 with an annual capacity of 30,000 metric tons. An advantage of the Spirex process is that it should be able to use a wide range of iron ore fines. Turbulent movement of the fines in the preheater and the first stage reactor is supposed to degrade the iron ore particles into smaller sizes and thus make them more uniform in size.

If the process proves to be commercially feasible, it should enable Midrex to offer its customers a wider range of options. Midrex is the leader in providing direct reduction technology. Its standard process, currently in use around the world,

accounted for 65% of DRI production in 1995. In this process, iron ore lumps or pellets are reduced using natural gas. Midrex and Kobe Steel are also developing the Fastmet process, which uses coal and iron ore fines to produce DRI in a rotary hearth furnace. A Fastmet demonstration plant has been operating in Japan for some time. Construction of a commercial-scale plant in Louisiana is expected to begin in the first quarter of 1997. Also, the companies earlier announced a project to develop an as yet unnamed process that will produce liquid iron for electric arc furnaces using a self-fluxing pellet made of pulverized coal and iron ore fines.<sup>1</sup>

### China-CVRD Agreements

On November 11, Baoshan Iron & Steel Corp. signed a contract with Cia. Vale do Rio Doce (CVRD), Brazil's largest iron ore producer, to increase shipments of ore from the current 6 million metric tons per year (Mt/yr) to 12 Mt/yr by 2000. The 6 Mt/yr currently being shipped is mostly Carajás ore, but includes 600,000 tons per year of pellets produced by CVRD's plant at Tubarão. At the same time, they also reached agreement to restart studies to set up a joint venture to mine iron at Carajás.<sup>2</sup>

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<sup>1</sup>Midrex Direct Reduction Corp. News Release, Oct. 1996.

<sup>2</sup>Metal Bulletin. No. 8131, Nov. 14, 1996, p. 21.

TABLE 1  
U.S. PRODUCTION AND SHIPMENTS OF IRON ORE, BY DISTRICTS 1/  
(Exclusive of ore containing 5% or more manganese)

(Thousand metric tons)

Period	Lake Superior		Other U.S.		Total 2/	
	Monthly	Year to date	Monthly	Year to date	Monthly	Year to date
<b>Production:</b>						
1995:						
October	5,542	51,946	23	322	5,565	52,265
November	5,089	57,035	57	379	5,146	57,411
December	4,991	62,026	48	427	5,039	62,450
1996:						
January	4,232	4,232	35	35	4,267	4,267
February	4,217	8,449	25	60	4,242	8,509
March	4,801	13,250	23	83	4,824	13,333
April	4,668	17,918	22	105	4,690	18,023
May	5,479	23,397	20	125	5,500	23,522
June	5,128	28,525	22	147	5,150	28,672
July	5,771	34,296	22	169	5,793	34,465
August	5,752	40,048	119	288	5,871	40,336
September	5,590	45,638	25	313	5,615	45,951
October	5,347	50,985	26	339	5,373	51,324
<b>Shipments:</b>						
1995:						
October	5,754	49,234	37	352	5,791	49,587
November	5,632	54,866	44	396	5,676	55,263
December	5,596	60,462	39	435	5,635	60,898
1996:						
January	3,363	3,363	12	12	3,375	3,375
February	1,315	4,678	21	33	1,336	4,711
March	2,357	7,035	25	58	2,382	7,093
April	5,290	12,325	20	78	5,310	12,403
May	6,317	18,328	21	99	6,024	18,427
June	5,925	24,253	17	116	5,942	24,369
July	6,396	30,649	29	145	6,424	30,793
August	6,230	36,879	29	174	6,259	37,052
September	6,341	43,220	29	203	6,370	43,422
October	6,232	49,452	23	226	6,256	49,678

1/ Excludes byproduct ore.

2/ Data may not add to totals shown because of independent rounding.

TABLE 2  
U.S. PRODUCTION, SHIPMENTS AND STOCKS OF IRON ORE IN OCTOBER 1/  
(Exclusive of ore containing 5% or more manganese)

(Thousand metric tons)

District	Production		Shipments 2/		Stocks 3/	
	1996	1995	1996	1995	1996	1995
<b>Lake Superior:</b>						
Michigan	1,331	1,325	1,416	1,321	2,059	2,647
Minnesota	4,016	4,217	4,816	4,432	3,460	2,701 r/
<b>Other U.S.</b>	26	23	23	37	112	73
<b>Total 4/</b>	5,373	5,565	6,256	5,791	5,631	5,422 r/

r/ Revised.

1/ Excludes byproduct ore.

2/ Includes rail and vessel.

3/ Includes mines, plants and loading docks.

4/ Data may not add to totals shown because of independent rounding.

TABLE 3  
CANADA: SHIPMENTS OF IRON ORE

(Thousand dry metric tons)

Period	Newfoundland	Quebec	Ontario	British Columbia	Total 1/
1995:					
October	1,985	1,435	50	7	3,476
November	1,823	1,314	55	7	3,199
December	1,442	1,473	83	6	3,004
Year total	19,969	14,121	1,020	83	35,193
1996:					
January	477	686	42	7	1,212
February	646	927	46	7	1,626
March	444	743	49	7	1,242
April	2,075	741	36	7	2,858
May	1,343	1,927	45	8	3,324
June	1,653	405	43	6	2,107
July	1,308	995	38	7	2,348
August	2,082	867	40	6	2,995
September	2,705	906	58	7	3,676
October	NA	NA	NA	NA	NA

NA Not available.

1/ Data may not add to totals shown because of independent rounding.

Source: Natural Resources Canada.

TABLE 4  
CONSUMPTION AND STOCKS OF IRON ORE AND AGGLOMERATES AND  
BLAST FURNACE PRODUCTION OF HOT METAL AT U.S. IRON AND STEEL PLANTS

(Thousand metric tons)

Consumption of ores and agglomerates				
Consumption by source	September		Year to date	
	1996	1995	1996	1995
United States ores	4,731	4,947	42,793	44,030
Canadian ores	603	642	5,622	5,872
Foreign ores	476	588	5,622	5,729
Total 1/	5,810	6,178	54,035	55,632
Consumption by process				
Blast furnaces	5,235	5,675	49,010	51,061
Steel furnaces	8	4	61	46
Agglomerating plants 2/	556	495	4,928	4,514
Miscellaneous 3/	11	4	34	10
Total 1/	5,810	6,178	54,035	55,632
Stocks of ores and agglomerates				
Storage point	September 30			
	1996	1995		
Furnace yards	15,718	15,471		
Receiving/transfer docks	2,190	2,294		
Total consumer	17,908	17,765		
Blast furnace production of hot metal				
	September		Year to date	
	1996	1995	1996	1995
Hot metal and pig iron produced in blast furnaces	3,995	4,289	37,321	38,032
No. of blast furnaces operating on the last day of the month	36	41	XX	XX

XX Not applicable.

1/ Data may not add to totals shown because of independent rounding.

2/ Iron ore and iron ore concentrates consumed in agglomerating plants not located at the mine site.

3/ Sold to nonreporting companies or used for purposes not listed.

Sources: American Iron Ore Association (consumption of iron ore) and American Iron and Steel Institute (production of hot metal and pig iron).

TABLE 5  
U.S. EXPORTS OF IRON ORE AND AGGLOMERATES, BY COUNTRY  
OF DESTINATION AND TYPE

(Thousand metric tons)

Country of destination and type	1996				
	1st Quarter	2nd Quarter	July	August	September
Canada	833	1,288	941	633	817
Mexico	5	2	(1/)	(1/)	1
Other	1	5	1	1	(1/)
Total 2/	840	1,295	942	634	818
Pellets	833	1,267	940	629	811
Other	7	28	3	5	7
Total 2/	840	1,295	942	634	818

1/ Less than 1/2 unit.

2/ Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census.

TABLE 6  
U.S. IMPORTS FOR CONSUMPTION OF IRON ORE AND AGGLOMERATES,  
BY COUNTRY AND TYPE  
(Exclusive of ore containing 20% or more manganese)

Country of origin and type of product	September 1996		Year to date 1996			Year to date 1995 (thousand metric tons)
	Thousand metric tons	Value 1/ (thousand dollars)	Thousand metric tons	Value 1/ (thousand dollars)	Value 1/ (dollars per ton)	
Australia	--	--	379	2,568	6.78	508
Bahamas, The	--	--	186	4,897	26.33	115
Brazil	230	5,280	3,934	98,780	25.11	3,711
Canada	1,252	42,536	6,377	215,685	33.82	6,044
Chile	9	155	105	1,624	15.47	25
Finland	1	55	7	362	51.71	9
Indonesia	--	--	--	--	--	(2/)
Japan	(2/)	1	(2/)	1	8.75	--
Mauritania	--	--	209	3,743	17.91	242
Mexico	1	18	5	86	17.20	--
Norway	--	--	--	--	--	14
Peru	--	--	43	476	11.07	54
Spain	--	--	11	181	16.45	--
Sweden	--	--	48	2,047	42.65	47
Trinidad and Tobago	--	--	--	--	--	5
United Kingdom	(2/)	8	(2/)	8	18.00	2
Uruguay	--	--	24	591	24.63	--
Venezuela	118	4,098	1,516	55,499	36.61	1,706
Total 3/	1,612	52,151	12,845	386,548	30.09 4/	12,482
Concentrates	260	4,183	955	17,044	17.85	1,094
Coarse ores	118	4,098	761	28,295	37.18	1,391
Fine ores	9	163	2,801	46,591	16.63	2,827
Pellets	1,201	42,898	7,947	283,653	35.69	6,432
Briquettes	--	--	--	--	--	35
Other agglomerates	23	753	372	10,566	28.40	695
Roasted pyrites	1	56	8	398	49.75	9
Total 3/	1,612	52,151	12,845	386,548	30.09 4/	12,482

1/ Customs value. Excludes international freight, insurance, and other c.i.f. charges.

2/ Less than 1/2 unit.

3/ Data may not add to totals shown because of independent rounding.

4/ Weighted average calculated from unrounded data by dividing total value by total tonnage.

Source: Bureau of the Census.

TABLE 7  
U.S. IMPORTS FOR CONSUMPTION OF IRON ORE AND AGGLOMERATES IN SEPTEMBER 1996  
(Exclusive of ore containing 20% or more manganese)

(Thousand metric tons)

Country of origin	Type of product						Total 1/
	Concentrates	Coarse ores	Fine ores	Pellets	Briquettes and other agglomerates	Roasted pyrites	
Brazil	149	--	--	59	22	--	230
Canada	110	--	--	1,142	--	--	1,252
Chile	--	--	9	--	--	--	9
Finland	--	--	--	--	--	1	1
Japan	--	--	--	--	--	(2	(2/)
Mexico	--	--	--	--	1	--	1
United Kingdom	--	--	(2	--	--	--	(2/)
Venezuela	--	118	--	--	--	--	118
Total 1/	260	118	9	1,201	23	1	1,612

1/ Data may not add to totals shown because of independent rounding.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 8  
U.S. IMPORTS FOR CONSUMPTION OF PELLETS, BY COUNTRY

Country of origin	September 1996		Year to date 1996			Year to date 1995
	Thousand metric tons	Value 1/ (thousand dollars)	Thousand metric tons	Value 1/ (thousand dollars)	Value 1/ (dollars per ton)	(thousand metric tons)
Bahamas, The	--	--	--	--	--	59
Brazil	59	2,316	1,258	47,176	37.50	993
Canada	1,142	40,582	5,845	203,950	34.89	4,737
Peru	--	--	--	--	--	36
Venezuela	--	--	844	32,527	38.54	607
Total 2/	1,201	42,898	7,947	283,653	35.69 3/	6,432

1/ Customs value. Excludes international freight, insurance, and other c.i.f. charges.

2/ Data may not add to totals shown because of independent rounding.

3/ Weighted average calculated from unrounded data by dividing total value by total tonnage.

TABLE 9  
U.S. IMPORTS FOR CONSUMPTION OF IRON ORE AND  
AGGLOMERATES, BY CUSTOMS DISTRICT  
(Exclusive of ore containing 20% or more manganese)

(Thousand metric tons)

Customs district	September	Year to date	
	1996	1996	1995
Baltimore, MD (13)	146	3,114	3,237
Buffalo, NY (09)	--	(1/)	--
Charleston, SC (16)	45	428	425
Chicago, IL (39)	492	1,921	1,832
Cleveland, OH (41)	145	543	1,048
Detroit, MI (38)	358	1,465	265
Duluth, MN (36)	--	51	--
Honolulu, HI (32)	(1/)	(1/)	--
Houston - Galveston, TX (53)	--	49	43
Los Angeles, CA (27)	--	(1/)	(1/)
Mobile, AL (19)	347	2,530	2,694
New Orleans, LA (20)	1	1,096	1,033
Nogales, AZ (26)	1	5	--
Ogdensburg, NY (07)	--	(1/)	(1/)
Philadelphia, PA (11)	67	1,622	1,890
Portland, ME (01)	--	(1/)	--
San Diego, CA (25)	9	9	9
San Juan, PR (49)	--	11	5
Total 2/	1,612	12,845	12,482

1/ Less than 1/2 unit.

2/ Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census.

TABLE 10  
U.S. IMPORTS FOR CONSUMPTION OF PELLETS, BY CUSTOMS DISTRICT

(Thousand metric tons)

Customs district	September	Year to date	
	1996	1996	1995
Baltimore, MD (13)	146	1,392	980
Charleston, SC (16)	23	215	273
Chicago, IL (39)	232	1,067	830
Cleveland, OH (41)	145	491	964
Detroit, MI (38)	358	1,442	257
Duluth, MN (36)	--	51	--
Houston - Galveston, TX (53)	--	41	43
Mobile, AL (19)	296	1,974	1,587
New Orleans, LA (20)	--	287	39
Philadelphia, PA (11)	--	987	1,459
Total 1/	1,201	7,947	6,432

1/ Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census.